

Series I  
Correspondence,  
1932-1973

Box 7, Folder 7

February 13, 1959 -  
February 19, 1959

0886

# ALASKA AIRLINES

INC.



ANCHORAGE ALASKA

NEW YORK OFFICE  
501 FIFTH AVENUE

February 13, 1959

Admiral Richard W. Bates  
12 Mount Vernon Street  
Newport, Rhode Island

Dear Admiral Bates:

Enclosed is some additional information on Convertawings, which I thought you'd like to see.

Admiral Clark asked Admiral Bergen to again allow me to attend the War College this year. There seems to be some discussion about it and, if you have the opportunity, I would greatly appreciate your looking into this with the hope that it doesn't get off the track for I would really like to attend.

Sincerely yours,

Charles F. Willis, Jr.  
President

*Route of the Starliners*



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CONVERTAWINGS INC.  
AMITYVILLE, NEW YORK

I.M. No. 173  
Page 1 of 1  
29 January 1959

MEMO

The four-rotor helicopter in the attached photograph was successfully flown by its designer in March, 1956.

It was completely controllable and stable.

This machine was built and flown entirely as a private enterprise to prove that a Quadrotor Helicopter had superior controllability.

Films of these flights and complete design data on this concept have been diligently and thoroughly presented to Army and Navy technical personnel concerned with aircraft development.

Convertawings has repeatedly sought an opportunity of making this Quadrotor design technique and its experience available for the use of the military services.

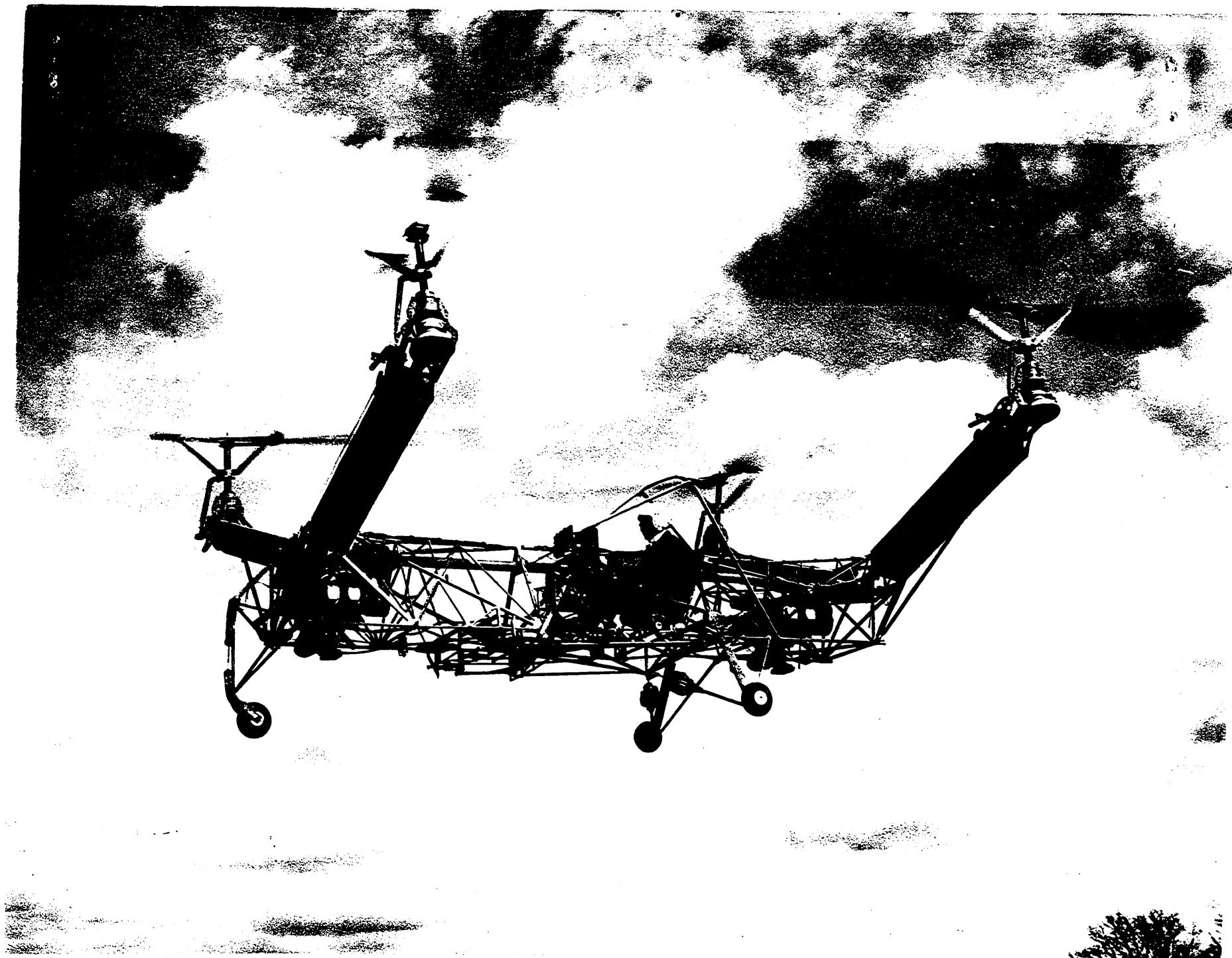
1. The Bureau of Aeronautics, in 1957, with a sole source contract with the Piasecki Aircraft Company of Newcastle, Delaware, undertook the construction of a four-rotor flying drone known as the Sea Bat project.
2. After a year and a half of effort and expenditure of over a million dollars, the machine had still not flown successfully and had no satisfactory control. BuAer personnel then sought out Convertawings for design information which has since been usurped by the contractor.
3. The Army Transportation Corps, in 1957, undertook the construction of a four-rotor aerial jeep with the Aerophysics Division of the Curtiss-Wright Corporation.
4. Convertawings' design was not chosen in this program on the basis of its using rotors instead of ducted fans, which were declared superior for the mission.
5. The use of ducted fans was found to be impractical and the Aerophysics design was modified as shown in the attached clipping. It has not yet achieved a solution to control and stability problems and has not yet flown. It is now a four-rotor helicopter.

The result of this situation is this:

1. Two to three years have been lost in achieving operationally useful vehicles.
2. Three million dollars of extremely limited research and development funds have been spent on a repetition of work previously completed successfully on private funds and known to the agencies involved.

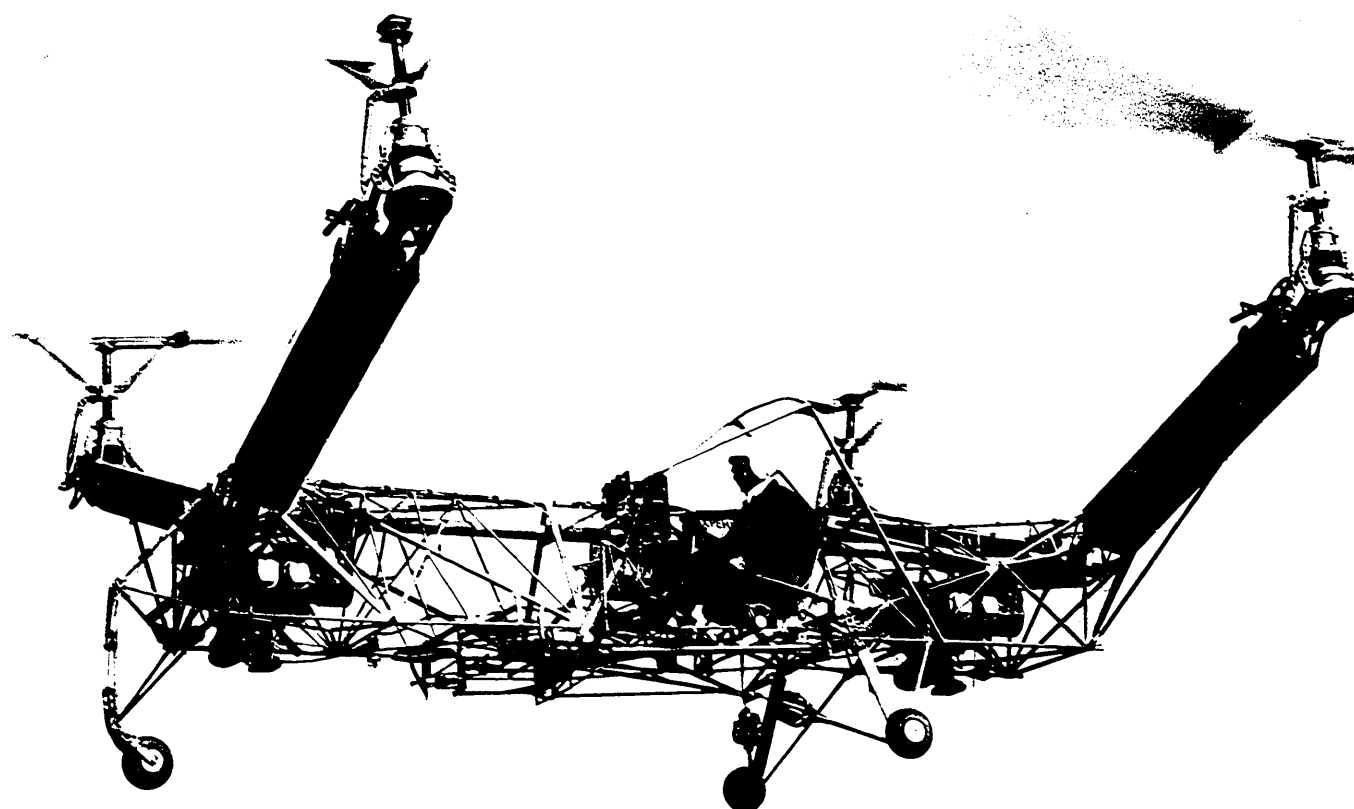
*D. H. Kaplan*  
D. H. Kaplan





The Quadrotor Model "A" prototype, flown on 30 March 1956. The Quadrotor system uses a unique system of control and rotor arrangement which made it possible for this vehicle to be the first four-rotor helicopter to demonstrate successful forward flight and stable control characteristics.  
Ref: ASTIA Document No. 148495.

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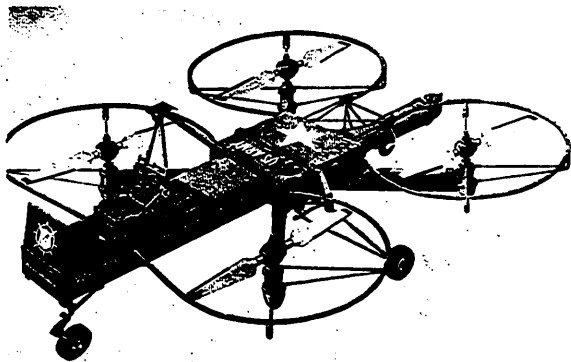


The Quadrotor Model "A" prototype, flown on 30 March 1956. The Quadrotor system uses a unique system of control and rotor arrangement which made it possible for this vehicle to be the first four-rotor helicopter to demonstrate successful forward flight and stable control characteristics.  
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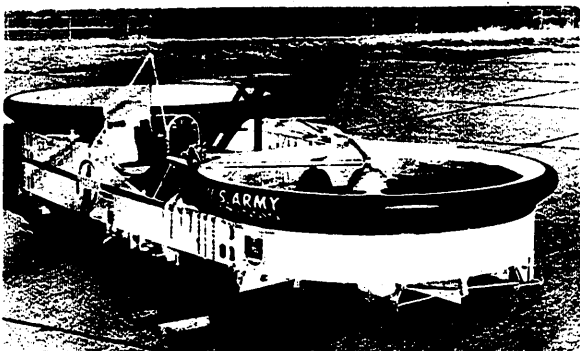
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AMITYVILLE, LONG ISLAND  
NEW YORK

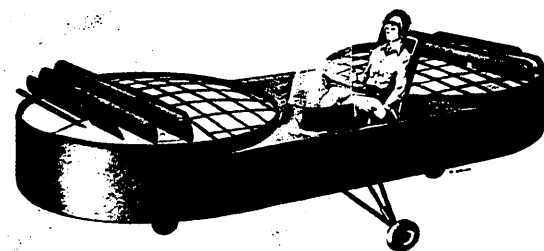
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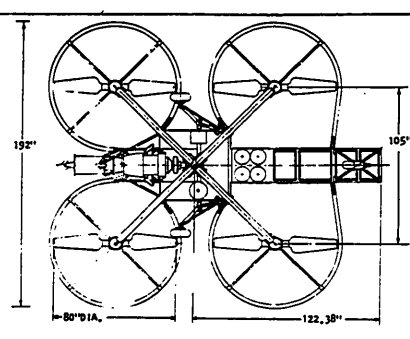
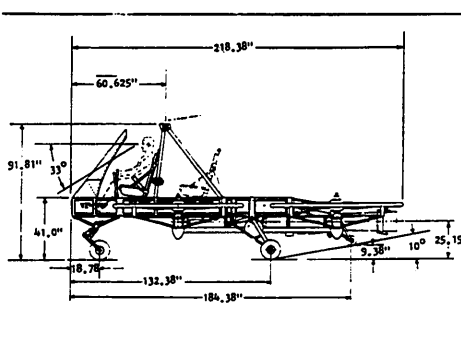
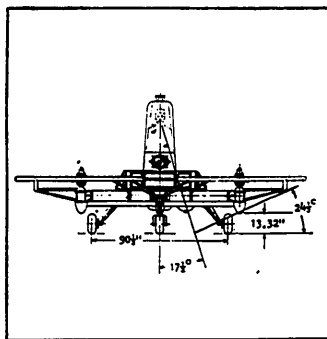
AEROPHYSICS VZ-7AP flying platform test bed uses rudimentary ring-guards around rotor-propellers to minimize drag and nose-up pitching in forward



PIASECKI VZ-8P test bed, first to fly, has rear shroud higher than front unit to minimize rotor-prop downwash. Tripod next to pilot's seat, is for test fitting of 105-mm. rifle.



CHRYSLER aerial platform, scheduled for rollout late next month, has complex system of vanes and cascades to provide forward thrust, cancel-out nose pitchup phenomena.



flight. Only turbine-powered platform of three in TRECOM competition, VZ-7AP has 425-shp. Turbomeca Artouste.

## Designers Face Flying Platform Controllability Problems

**Detroit**—Considerable research and development faces industry and U. S. Army Transportation Research & Engineering Command in solving the numerous stability and control problems inherent in the flying platform concept in the face of a paucity of basic and applied research data available.

With a relatively small core of information to work with, the trio of winners of TRECOM's aerial platform competition will have to rely primarily upon their own resources backed by the lessons they learn as a result of flight testing the six test bed vehicles ordered by TRECOM.

First details of the three varied approaches taken by Aerophysics Development Corp., Chrysler Corp. and Piasecki Aircraft Corp., which are building the first tangible hardware to test their theories, were divulged by company representatives during a recent Society of Automotive Engineers meeting in Detroit, with discussion of National Aeronautics and Space Administration research in this field by an engineer from Langley Research Center.

Each of the three contractors will build two test bed configurations of their proposals under the current Army contract—award of production vehicles will await proof of the concept's feasibility. In addition to developing a stable, useful vehicle, Army will consider cost a prime requirement, probable quantitative procurement will most likely be inversely proportional to production costs, Larry M. Hewin, of TRECOM, pointed out.

Vehicles discussed at Detroit were: • **Chrysler tandem duct piston-powered platform**, scheduled for rollout late in February, which features rigid rotor-propellers and a system of vanes, louvers

and cascades to provide propulsion, stability and control.

• **Aerophysics VZ-7AP** controllable-pitch four rotor-propeller platform, powered by a 425-shp. Turbomeca Artouste IIB turbine, currently under construction.

• **Piasecki VZ-8P** tandem-duct platform, with three-blade rigid rotor-propellers, which has been flying since October at Philadelphia International Airport, Pa.

### Pitch, Roll Stability

Unstable oscillations in pitch and roll are fundamental stability characteristics of the flying platform in both hovering and forward flight, it was pointed out by NASA research engineer M. O. McKinney, who provided data based on limited model tests.

In the case of the unshrouded rotor-propeller, a downwash on the rear portion of the prop disk, caused by the forward part of the prop disk, reduces the thrust of the rearward portion of the disk and provides a nose-up pitching moment. For a shrouded rotor-propeller, the downward flow is deflected through the duct at a larger angle, leaving it parallel to the propeller shaft axis and providing a larger drag than that of an unshrouded propeller.

In the case of cross flow across the shroud, there would be an increase in flow over the leading lip of the shroud and decrease over the rearward portion, causing unequal pressure distribution and also very likely, unsymmetrical thrust distribution—these being additive, there would be a nose-up pitching moment larger than for the unshrouded rotor-propeller.

In the case of a tandem configuration, pitchup would be aggravated, since downwash of the leading rotor-

propeller on the rear unit would decrease the latter's thrust. Damping of the resulting oscillation was less critical for a two-shroud tandem configuration than for a four-shroud model tested by NASA because the latter had a shorter moment. Rolling oscillation of both two and four-shroud models was very unstable because of the low roll moment of inertia—in the case of the latter configuration, the model was only a little longer than wide. NASA experience showed that roll and pitch oscillations could be completely stabilized using artificial damping, McKinney noted.

In forward flight, drag of shrouded rotor-propellers normally would require considerable nose-down tilt to establish fore-and-aft balance of forces—a rule-of-thumb provided by McKinney is ap-

proximately one degree forward tilt for each mile-per-hour of speed. A series of movable vanes could be used to turn the thrust backward, forward force on the vanes acting to offset shroud drag, McKinney stated.

Nose-up pitching, caused by action of the forward rotor-propeller downwash on the rear unit of shrouded configuration, would be aggravated by use of turning vanes beneath the shroud to reduce nose-down tilt, unless they were fitted under the front shroud only. Also, an unstable pitching moment would result from center of thrust moving markedly ahead of center of gravity due to angle of attack needed for forward flight.

### Dynamic Stability

Dynamic stability investigation, although limited, showed that unstable rolling oscillation evident in hovering flight increased in forward flight. This was noted that as the airspeed of the model increased, the model became unstable with the same amount of artificial roll damping that had stabilized it in hovering flight. It was possible to cure this by increasing the artificial damping.

Hovering control of a four rotor-propeller configuration can be fairly simple and straightforward, McKinney reported, with pitch and roll control obtained by varying thrust at opposite ends or opposite sides; yaw control could be provided by means of a simple control vane beneath the rotor-propellers or by varying total pitch to provide net change in torque.

A two rotor-prop configuration would be more complex to control in hovering, McKinney noted. Suitable roll control can be produced by cyclic variation of blade angle of non-articulated rotor-



COCKPIT of Piasecki VZ-8P has flight controls resembling conventional helicopter. Collective pitch lever is on the left side.

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**Aviation Week**  
Including Space Technology

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props to produce more thrust on one side of the disk than on the other. Spoilers or drag devices would not provide a corresponding increase in thrust on the opposite side, so are not considered satisfactory, he continued. Exhaust thrust is insufficient to provide sufficient power to give the required moment and a vane under the propellers would have to extend so far beneath the machine as to spoil the primary advantage of its low silhouette.

### Lateral Control

Forward flight control experiments indicate that any lateral control system satisfactory for hovering flight would also be suitable in forward flight. Additional requirements would be placed on the longitudinal control system to handle the large nose-up pitching moments encountered, he noted.

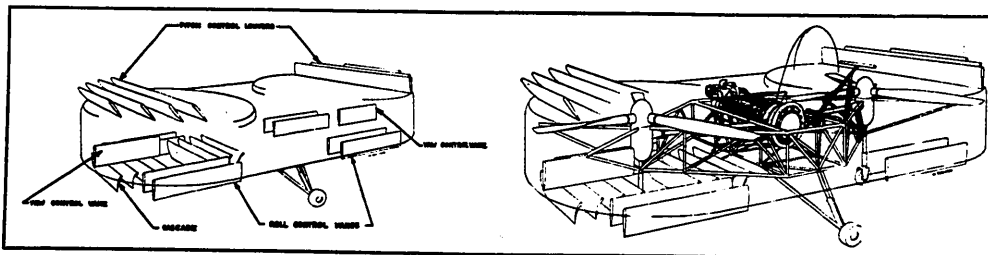
Large change in trim would make it difficult to provide sufficient control to stabilize the nose-up pitching condition with a single stick control without having excessive control sensitivity for hovering flight, McKinney indicated. A thumb switch on the stick would be, at best, a clumsy, coarse additional control, he said. Turning vanes, under the front shroud only, could reduce need for an overly sensitive control and obviate need for a thumb switch if they were linked to move in conjunction with pitch control. It might be desirable to have nonlinear variation of vane deflection with stick deflection so that stick movements near center, required for hovering flight, would not cause excessive linear accelerations because of vane deflection.

In the Chrysler vehicle, since the decision had been made to use simple rigid rotor-propellers and thus use of conventional collective and cyclic pitch were ruled out, a system of louvers up stream of the rotors was developed to provide both trim about the pitch axis and a broad band of control above and below the trim curve. To provide trim and roll control about the roll axis, a system of roll vanes is located downstream of the rotor in the duct outlet. Yaw control is obtained by means of a single vane in each duct, also downstream of the rotor.

### Stick Movements

Fore and aft movement of the stick activates the pitch louvers in the duct inlet to provide nose-up and nose-down movements; lateral displacement of the stick produces movements in the roll vanes in the duct outlets; foot pedals activate the yaw vanes. Cascades located in the outlet of the front duct only deflect the slip-stream rearward to produce propulsive force.

Ducts were experimentally developed in the wind tunnel, starting with a large inlet lip radius and reducing it step by



CHRYSLER system of cascades, under front duct only, provides slipstream deflection to increase propulsive force and overcome drag.

step, Chrysler defense operations project engineer John V. Gorton reported. It was noted that as inlet radius of the duct was decreased, nose-up pitching was lessened, as was thrust augmentation. Final design is aimed at optimizing these factors. Conventional three-blade propellers were tested in a full-scale static test bed. Twist distribution of the blades was varied by physically twisting them in a hydraulic fixture until optimum thrust per horsepower was realized. Blades in the Chrysler test bed are 8.5 ft. diameter.

Chrysler flight test bed is approximately 23 ft. long, 10 ft. wide and 4.5 ft. high. Gross weight, including pilot, fuel and test instrumentation will be 2,000 lb.

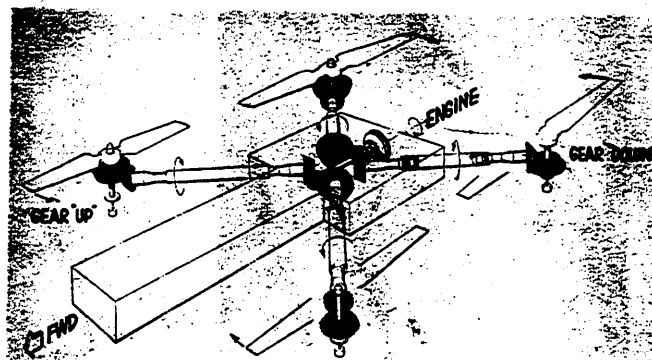
Powerplant is a six-cylinder Lycoming with takeoff rating of 380 hp. at 3,400 rpm. and continuous rating of 360 hp. at 3,200 rpm. Two modifications made to the engine are removal of the normal reduction gear box and installation of a gear box that transmits power through extension shafts to the front and rear rotorprops. Engine also powers a cooling fan.

At each propeller is a reduction gear of approximately 2:1 ratio to provide some 1,550 rpm. to the propeller shaft, and also counter-rotation of the props. The drive line system has no clutches.

### Tubular Airframe

Airframe is all-welded alloy steel tubular structure, the central portion being a box frame supporting engine, pilot and main landing gear. Fore and aft trusses support front and rear propellers and ducts. Two main oleo struts of the landing gear are on either side of the center section and two secondary struts, beneath the propeller gear boxes, have full castoring wheels.

Flight duration will be approximately 30 min. Program currently calls for 50 hr. of tiedown and hovering testing prior to free flight trials. Four-rotor configuration was chosen for Aerophysics VZ-7AP because its relatively large disk area promised good ratio of weight lifted to power produced, also because of the possibility of controlling large pitch and rolling mo-



AEROPHYSICS rotor system provides differential propeller pitch (above); hub detail (below).



ments by adjusting the rotor thrusts.

Initially the design considered the use of shrouded rotors, but considering the drag, required large tilt angles or use of vanes, it was decided to delete the shrouds and use only rudimentary rings around each rotor-prop which increased propeller diameter, gave lower disk loading. Rings appear to provide a 4% gain in hovering thrust.

Concurrently it was considered necessary to provide flapping and drag hinges on the blades, Aerophysics project engineer Robert W. Evans reported. He notes that following flight tests, during which control without ducts has been demonstrated, the company may investigate performance gains to be obtained by installing them.

### Rolling Moments

Aerophysics expects that due to rotation of the right and left propellers in opposite directions and phasing of the rotors, the rolling moments will be canceled out in normal forward flight. Pitching moments are additive, Evans notes, and require application of increasing thrust to aft propellers as the platform goes from hovering to forward flight.

Artificial stability augmentation has been developed because an analytical study indicated that the VZ-7AP would be difficult to control due to a divergence in pitch and roll having a period of about five seconds. Stability augmentor is being built to Aerophysics specifications by Kearfott, Inc.

Pitch and roll control by the pilot is by moving the control stick forwards, aft and sideways, differentially controlling the pitches of the four propellers; yaw control is by means of foot pedals which control a rudder in the exhaust system of the 425-shp. Turbomeca Artouste II turbine. Collective and differential pitch controls are linked. The control cable on each propeller hub operates a hydraulic servo system which changes the pitch of two propeller blades equally.

Transmission system from the engine takes 6,000 rpm. and distributes it to the propellers which turn at 2,150 rpm. Transmission was designed in cooperation with Sargent Engineering Co. Central gear box has an input shaft carrying two spiral bevel gears, each driving two intermediate shafts. These shafts lead diagonally to the four rotor-prop gear boxes, where right-angle spiral bevel gear drives are used. Shafts between turbine, main and propeller gear boxes have spur-gear type universal couplings.

VZ-7AP will be approximately 17 ft. long by 16 ft. wide; the cargo floor is 41 in. from the ground and measures 4 ft. x 4 ft. Vehicle has a dry weight of approximately 1,700 lb. and can carry a useful load of about 555 lb., Evans

101 Washington Street  
Newport, Rhode Island  
19 February 1959

Dear Rafe:

The last month has been extremely busy--highlighted by a very interesting week in Washington working on the Industrial College curriculum evaluation and four days in Columbus, Ohio, at the Ohio State Logistics Conference. For your edification I am enclosing a copy of my report on the conference and some remarks on research and education.

My book is going to press this week and the publisher promises galley proofs by the 2nd of March. We will then have to settle down to proofreading and indexing which is a laborious task.

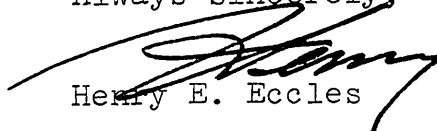
Doctor Wriston gave me a wonderful preface a copy of which I also enclose.

Newport affairs seem to be going well. The weather has been very changeable but not severe. The City Council has just come up with a tentative budget which raises the tax rate about \$5.00. We can expect considerable comment on this. The City Manager setup is still unresolved. No one is saying very much about Raytheon. The War College is making preparations for setting up an "Advanced Study Group." Charlie Lyman is leaving this week. Isabel has taken off her cast and is beginning to buzz around as usual. Leroy behaved very badly at Quindecim and I made the mistake of trying to give him some information and was very rudely rebuffed. I see no answer to that except to avoid him. The Preservation Society is gaining vigor under the leadership of young Mr. Robert Kerr. All in all the situation is about what you might expect in the middle of February. There is one serious fault and that is that you are not around. We miss you everywhere and look forward to seeing you back soon, even if only for a temporary stop on your way to distant lands.

Incidentally, at Columbus I had a very interesting discussion with Professor Norman Gibbs, Head of War Studies at Oxford University. As a result I asked him to spend a few days with us in Newport on his way back to England in March. Slim has invited him to make an unofficial visit to the Naval War College.

That about buttons things up. Good luck to you.

Always sincerely,

  
Henry E. Eccles

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**FOREWORD**

**by**

**Doctor Henry M. Wriston**

**Doctor Wriston is President of The American Assembly  
at Columbia University.**

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When Admiral Eccles suggested I should read "Logistics in the National Defense", my first reaction was spontaneous: Why should a civilian seek understanding of so technical a military subject?

The text shows, almost at the outset, how clearly a layman can profit; matters dealt with are of prime importance and right treatment of them will be controlled - in the last instance - by public opinion. Without public appreciation of the central issues the military will be severely handicapped. The business side of national security is very big business indeed. In fact it is the biggest business there is. The author points out that if General Motors, General Electric, United States Steel, and the American Telephone and Telegraph Company were rolled into one their gross revenue would be less than half that spent on defense and the number of their employees only a little more than a third those employed in defense. That is public business with a vengeance.

Nearly everyone has read "Parkinson's Law", the witty and provocative essays of the learned Raffles Professor of History at Singapore University. His famous "law" was based upon the observation that the shrinkage in the fleet did not result in less work at the Admiralty; on the contrary personnel in the administrative "tail" increased as fast as the combat personnel shrank. The smaller the fleet, the larger the Admiralty.

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Admiral Eccles never mentions Parkinson, but he does explain this paradox. He gives both the legitimate - and the illegitimate - reasons, with equal fairness and cogency. The increase of complicated equipment - so often mislabeled "push-button defense" - requires a higher ratio of support units to combat units than simpler weapons needed. This point is developed with explicit illustrations which are completely convincing.

Indeed the whole impact of the industrial and scientific revolutions upon the logistical problem - both in theory and practice - is fully explored. Moreover it is closely related to the consequent change in the nature of war and the involvement with "more areas of human relations, activities of people, elements of power, and tools of conflict."

This book is just as candid and enlightening with regard to the improper multiplication of men, materials, and procedures. The "logistic snowball" is described, from its origins to its disastrous climax, with clarity and precision. Indeed, he rightly says: "The concept that logistic activities naturally tend to 'snowball' or grow out of all proportion to the tactical forces which they support is perhaps the most important single thesis of this book." And that assertion is thoroughly documented. The discussion covers many of the reasons, among them the tendency to think that officers and men of less capacity are adequate to these, "subordinate" and auxiliary tasks. The disastrous wastefulness of the misconception is proved with devastating thoroughness.

The development of the concept that logistics constitute a bridge between the national economy and the combat forces is admirable. It explains the role of the civilian as well as of the professional. It reveals the differences in their modes of thought and methods of operation. It recognizes the validity of each in its own sphere and outlines the reasons for the impropriety of applying one set of rules and procedures to the other range of responsibility. Civilians will find this part of the book illuminating. It is rare to find a professional in any field as perceptive of the propriety of methods alien to his own, which nevertheless infringe upon his field of thought and action. It suggests, at least by inference, that reciprocal sensitiveness to the military ideas and methods upon the part of the civilian would be welcome, and in the national interest.

The passages upon "duplication", "waste", competition among the armed forces, are luminous as well as frank and realistic. The endless arguments about centralization and decentralization are reviewed fairly - and with a tolerant spirit. The absolute necessity for compromise, for cooperation upon the human level get great stress. It is hopeful of less friction to see such perceptive treatment of the age old dilemma between design of a flawless organizational structure and the personal relationships which can make the theoretically poor organization work tolerably well, and a perfect structure fall flat.

To one trained in the academic disciplines and a member of academic communities all my working life, it is music to hear theory well spoken of. Theory is not just dreams or wishful thinking. It is the orderly interpretation of accumulated experience and its formal enunciation as a guide to future intelligent action to better that experience. This volume not only speaks well of theory, it is a demonstration of the value of that method of approach. "The search for comprehensive theories is the best way of...developing the understanding of principles and of cause and effect relations which may guide the responsible men who must choose among conflicting theories." Pointing the discussion toward sound doctrine helps the civilian grasp the essence of the matter.

To a layman reading in a professional field one other essential quality marks this volume. When a theory has been expounded there are illustrations to make clear both its relevance and significances. This volume is based on wide reading - as the notes amply demonstrate. It is founded upon  
1 severe analytical and sternly disciplined thought. It is filled with material which can only have been the fruit of long, first hand experience. It is made more instructive by historical instances outside the author's own observation but available to him in the voluminous literature.

Finally this is an intensely logical book. Recognizing that there is interplay and overlap among the several elements the author discusses, he does not hesitate to come back to the

same subject several times in order to put it into its proper context in the different frames of reference from which the matter is approached in the several sections of the book.

It is not light reading, designed to relax a civilian after a hard day's work. But it is solid, clear, interesting - and immensely informative.

## Comments on Ohio State University Logistics Conference

Somebody said, "We must have a Logistics Conference," then started to look around and find out what might be involved. Because no one has as yet put a logistic theory and philosophy into print, little agreement could be found as to what should be discussed even among those who had studied the subject. The resulting program was good in spots but lacked adequate continuity. The conference itself was spotty. Some papers were excellent while others were vague and poorly prepared. About 125-130 were present at the opening session.

In his introductory remarks, Doctor Harding, Executive Secretary of the Ohio State University Committee on Defense Studies, expressed gratification at the success of the Defense Studies Group in developing ROTC programs for the Army and Air Force. This seemed to be a very low level of consideration. Most of us who have been involved in the study of logistics and strategy feel that the emphasis should lie on the postgraduate rather than on the undergraduate level.

The conference itself then started very well with a splendid presentation on "The Military View of Logistics" by Major General Frank Bogart, USAF, whose remarks will be well worth reading when the record is published.

In the afternoon Mr. J. Carlton Ward gave a fine talk on the problems of mobilization and on the comparative economic potential of USSR and USA. It was titled "Technology, Industry and Logistics."

This was followed by a penetrating and witty talk by Professor Meno Lovenstein.

The discussions were good.

The second day was devoted to panel discussions wherein the speakers varied from excellent to poor. Some serious defects were obvious. One man denied any relation between strategy and logistics. Others, as is common in such conferences, dwelt at length on trivial technical detail. There was an undue preoccupation with long range thermonuclear weapons. One man gave an old fashioned Air Force party-line talk quite different from the broad concepts I have recently heard at the Air Force School of Logistics.

In the afternoon there was a discussion of weapons systems, highlighted by excellent papers by Captain E.D. Stanley, SC, USN, and Dr. William B. Keeling of the U.S. Air Force. These two papers showed the type of thoughtful coordinated preparation that is required to make a "live" conference.

Enclosure (1) - 1

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There also appeared to be a strong plea for quick, practical operational results from logistics research.

The day was notable for almost a complete absence of discussion of the problems of ground forces or of limited war. At the last, Colonel McKee of the Army War College commented appropriately on this deficiency.

On the last day the morning was devoted to technical discussions which I skipped in order to pinch hit for an indisposed member of the afternoon panel.

The last afternoon session was sparsely attended. It was titled, "Toward a Comprehensive Theory." Here presentations were diffused and somewhat uncertain. Dr. Rigby started his remarks by some well chosen corrections of remarks previously made by other speakers. He also pointed out that this was the seventh logistics conference he had attended. He then went on to discuss the place of mathematics in logistics research and expressed his research philosophy.

I completed the presentation with the attached comments on theory, Enc. (2).

During the discussion period Dr. Nathan Brodsky commented on Dr. Rigby's emphasis on mathematics. Dr. Brodsky stating the opinion that the practical results of Navy logistics research were negligible. These thoughts were in turn rebutted by several supply officers who pointed out specific savings running into tens of millions of dollars directly attributable to the mathematical theories of inventory control developed at negligible cost by C.N.R. contractors.

The conference ended with my summary remarks, Enc. (3).

By this time only about 50 persons were present.

### Conclusions

In general the conference was inadequately focused and covered too much territory; much of it not properly related. This great scope cut down on the time allotted for discussion from the floor.<sup>1</sup>

The hardware and weapons systems are vital elements of our research problem. But, they should not obscure the Idea Research which is essential to the appropriate and effective employment of the hardware and weapons systems.

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<sup>1</sup> Previous logistics conferences have suffered from this same fault and from being classified as "secret."

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The subject is so huge that future conferences can be expected to have major value only if:

- (a) They are based on a broad theoretical concept,
- (b) They attempt to develop only strictly limited detailed areas of such concept,
- (c) They are held periodically in manner, composition, and with personnel designed to develop various limited areas in a logical succession.

Since the most important and difficult phases of the logistic problem are unclassified, logistics conferences should be unclassified.

If we can apply these lessons of experience, I recommend that you encourage a long range program of logistics conferences.

Specifically I recommend:

1. Support Idea Research as a vital part of our Defense Research Program.
2. Recognize that military philosophy and military theory form the foundation of such Idea Research.
3. Take steps to establish--away from Washington--a small research organization devoted to Idea Research in the strategic-logistic area.
4. Encourage a program of unclassified logistics conferences designed to ascertain and develop fundamental logistic theory and concepts.

Respectfully,

Henry E. Eccles

Enclosure (1) -3

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Concluding Summary

by RADM H. P. Eccles, USN, Ret'd.

Some observations on the conference talks and discussions.

The talks and discussions had a very wide range and at times went into great, if not significant, detail.

This was to be expected in such a group dealing with such a broad subject.

The point of view expressed was primarily that dealing with the creation of weapons and with procurement. Very little was said as to the employment and the problems caused by variations in employment of weapons systems.

Thus the emphasis was on the problem of the Secretary of Defense, and of the Pentagon. Very little emphasis was given to the commanders who must employ a wide range of weapons over a wide range of situations.

Most of the emphasis was placed on the problems of long range thermonuclear weapons. While these are vital, they do not comprise the whole problem.

We are in danger of falling into the intellectual trap described by Alfred North Whitehead who said that what plays the devil in human affairs is the "half truth" when it is mistaken for the whole truth.

There may be a tendency to overemphasize a weapons system to the point where it may develop into a weapon strategy.

The psychological aspects of this problem must be appreciated lest we become slaves to an attractive concept which can induce both strategic rigidity and the logistic snowball.

Many excellent and important statements were made. Among them:

General Bogart: His remark that potential deterrence is possible but it does not end the power struggle.

His emphasis on the need for weapons systems being operational in the development stage.

His comments on unpredictability of situations and meeting unpredictability by flexibility and responsiveness.

His thought that logistics research must study the abnormal while dealing with the normal.

And the need for research to show how the military objective differs from business and the influence of this on civilian-military relations.

Mr. Ward's advice to study the forces of history seems excellent. His excellent discussion of national economics and of comparative war potential should not be interpreted as the idea that the future will bring the "Industrial Mobilization" type of war as we fought in 1940-1945. A knowledge of comparative capabilities in the broad categories mentioned is only the first essential element among many which we must understand in order to estimate the situation and make specific plans.

Doctor Moore's comments on the dynamic aspects of logistics and the distinction between uncertainty and variability were excellent.

However, I would suggest that a deeper study of the sources of logistics flexibility, particularly as they are related to strategic flexibility might lead to an understanding of how best to deal with uncertainty.

Paul Fitt's point that "logistics depends on people," while so obvious as to be almost trite, is so frequently forgotten that it must be reemphasized repeatedly. This is the key to the "Logistic Snowball."

His comment that the world responds to the impression of readiness which we make is very important.

Again this points up the need for logistic-strategic flexibility.

This then brings the question of weapons systems to a natural focus: Captain Stanley's and Doctor Keeling's carefully thought-out remarks were most pertinent.

The need to specify areas which you don't try to control.

The advantages of grouping systems and the need to discriminate among weapons systems.

The need for interchangeability of spares among weapons systems.

The above were most pertinent. These down to earth practical observations also apply to the need for the ability to employ weapons and systems in different combinations which are appropriate to the specific objectives and the particular situation of a field or fleet commander. This, in turn, raises the vital and difficult question of "Command Control of Logistics."

Doctor Keeling's comment that there must be a base capability to receive weapons systems successively seems most important.

Finally, I would suggest that whenever we speak of a weapon, a system, a policy, or, an organization, we should discuss its objectives, its capabilities, and its limitations. Otherwise we become mere hucksters.

In conclusion I wish to express my appreciation for being able to take part in this conference and the hope that we all shall be able to learn more about this vital, fascinating, though indefinable subject, LOGISTICS.

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Remarks by RADM. H. E. Eccles, USN, Ret'd.

Panel 8

"Toward a Logistics Theory"

The study of war in terms of it being part of an overall spectrum of human conflict has been neglected.

The magnitude and depth of this study has been grossly underestimated by scholars, scientists, civilian executives, and military leaders.

It has been wrongly assumed by some that a person trained in a discipline unrelated to history and to strategy can work with assurance in the field of war study and military planning without first undertaking considerable further study.

No part of the study of war can be thoroughly understood without understanding its relation to the other parts. Logistics and strategy cannot be divorced for neither can be understood without understanding the other.

No theory of war, no theory of logistics, can ever be as specific or as rigorous as a theory of mathematics, or of physics. Nevertheless, the development of a comprehensive theory of war is essential if we are to deal wisely with the problems posed by human conflict.

The theory will never pretend to solve these problems. It can shed light on these problems.

Logistics, itself, cannot be strictly defined. It can be described. Descriptions will differ depending on the level and point of view of the observer.

A rigorous scientific theory of logistics will never be evolved.

However, these facts should not distract us from the attempt to formulate a group of descriptions, a group of concepts and a group of cause and effect relationships. I believe it permissible to call this assembly--a General Theory of Logistics. Within such a comprehensive, loose theory there is ample room for rigorous scientific theories dealing with some parts of the topics we include in the general description of logistics.

These thoughts seem to be harmonious with Doctor Churchman's third type of theories, i.e. "Theories as Summaries of Data." He also says, "Theories are means by which information is generalized."

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While, as he suggests, this may be destructive of scientific research, our primary purpose is not the advancement of Scientific Research; our purpose is "to preserve a free civilization in a world of human conflict." Churchman went on to say, "Theories are those activities which have the function of maximizing the utilization of specific classes of information."

I therefore offer a loose grouping of several specific classes of information relative to the understanding of human conflict, of war, and of some of their most significant component parts.

### Comprehensive Theory of War

#### A Theory of Human Conflict

The Spectrum of Conflict.

The Vital Factors in Conflict.

The Tools and Weapons of Conflict.

The Limitation of Conflict and the Limitation of the Tools and Weapons.

The Relation of Treaties and of Law to War and Conflict Objectives - Nature - Limitations.

#### A Theory of Strategy

The Nature of Strategy.

Its Relation to Policy and Objectives.

Concepts of Strategy.

The European Concept of "Operations."

The Relation of Strategy to Tactics, to Logistics, and to Economics.

Geopolitics and War Potential.

The Integration of Planning.

Strategy and National Human Values.

The so-called "Principles of War."

Objectives.

## A Theory of Logistics

The Nature of Logistics--The Means of War.

The Relation to Strategy--to Tactics--to "Operations"  
--to Administration and Management--and to Economics.

Geopolitics and War Potential.

The Structure of Logistics.

The Functions of Logistics.

Logistic Concepts.

Logistic Cause and Effect Principles.

The Objective of Logistic Effort.

The Criteria for Judging Logistic Efficiency.

The Problem of Information.

Command Control of Logistics.

Logistic Command and Organization.

## A Theory of Tactics

The Nature of Tactics.

Its Relation to Strategy.

Its Relation to Logistics.

Concepts--Rosinski and "control"

The "Principles of War"

The European Concept of Operations.

## A Theory of Command Decision

Sound Military Decision

The Estimate of the Situation.

The Development of the Plan.

The Supervision of the Planned Action.

The Objective as a Unifying Concept.

A Theory of Command Decision - Continued

The Requirement for and Use of Intelligence.

The Planning Process--Major Broad Elements.

The Problem of Information.

Planning Factors.

The Integration of Planning.

A Theory of Organization

Types of Organization.

Basic Principles of Organization.

Centralization and Decentralization.

Business versus Military Organizations.

Similarities and Differences.

Criteria of Judgment--Testing of Organizations.

Conflicting Concepts.

Regional versus Functional.

Line versus Staff.

Special Factors in Military Organization.

Types of Command and of "Coordination."

Task Force System.

I believe one of the most important functions of such a comprehensive view is to give the members of a conference such as this, a better sense of focus, of coherence and definite purpose.

I further believe that if this focus is to be sharp, we must recognize that the element of military command responsibility is inescapable.

## Notes on Logistics Research and Education

by RADM. H. E. Eccles, USN, Ret'd.

February 1959

### I. Background

Recent developments lend special significance to the need for a general review both of logistics conferences and of logistics education because research and education are inherently closely associated.

(a) Today the Air Force is making a major new effort in logistics education at its new School of Logistics.

(b) A proposal has been made that the Army increase its study of logistics.

(c) The Industrial College of the Armed Forces has been critically examining its methods. The new building now underway at the ICAF is stimulating a lot of thought as to its purpose and position which naturally must involve re-examination of its curriculum.

(d) The Naval War College is setting up a special study group to look into the deeper aspects of strategy and sea-air power. Naturally logistic considerations should be a vital part of such a study.

All these combine to form a definite pattern of new ideas. Logistics conferences and the various university defense studies are a significant part of this overall pattern.

In considering these matters it is important to distinguish between the research aimed at ascertaining principles of logistics and the research aimed at determining the nature and level of the logistics content of our war college and service school logistics curricula. A still third area of research is that aimed at judging the effectiveness with which a particular school is accomplishing what it sets out to teach. While these three areas have much in common they should not be confused.

### II. From Philosophy to Operations

Philosophy establishes the point of view and the attitude with which we approach the broad problems of National Security.

The theory establishes the major elements, their relation, and the general cause and effect principles.

The policy establishes the general guidance under which officials work.

The doctrine establishes the policy or specific action normally to be applied to recurring situations.

The operation plan directs specific action to be taken for a particular situation which has arisen or is expected to arise.

If the philosophy and the theory are faulty, the policy, the doctrine and the operation plans will inherit these faults. However, these faults may be and usually are concealed until a crisis. In today's world, loss of control in time of crisis can be a national or world catastrophe. This can be aptly illustrated by the Maginot Line where France actually used a "weapon strategy" based ultimately on bad philosophy and theory.

### III. Idea Research

The coordinated study of these sequential elements of philosophy, theory, policy, doctrine, and plans, comes under the broad heading of Idea Research.

The cost of idea research is infinitesimal in relation to its value and the cost of military hardware.

Correct ideas govern the choice of hardware and the employment of hardware.

Idea research and high level military education are inseparable.

The basic and most important part of idea research lies in the area where strategy and logistics meet and blend in a way which defies accurate description.

The strategic-logistic area is where civilian-military relations are both critical and difficult.

In problems of military organization both idea research and education are greatly needed. In military organization we must view the problems from two levels:

That of high international, national and departmental concern, where it must be controlled by civilians who are advised by the military.

That of the military commander in the field who must employ the forces created in accordance with objectives and policies decided by civilians on the highest levels.

Frequently we find a contradiction between the best solution to a problem as seen from the national level and the best solution as seen from the field level. Unless one has an understanding of basic principles and theory the compromises which are inevitable may be haphazard or one sided.

A good analogy is found in the type of compromise that an engineer must make between objectives and means or between the competing claims of conflicting technical considerations in design. His best guide is a sound understanding of engineering theory.

It is my deep conviction that these various elements of the whole problem and their proper relation can be clearly seen only when they are examined in the light shed by a comprehensive view of war and of conflict as a whole.

While we can call this view "a comprehensive theory of war" it can never be as precise or as rigorous as a theory in mathematics or the physical sciences.

All civilian and military high education groups who deal with strategy, logistics, national defense policy, and civil-military relations, should study and develop such a comprehensive view of the problem; otherwise they court superficiality and frustration.

The frustration and ineptness of some of our university studies and conferences are due to lack of clear focus on the problem as well as the personal limitations of individuals.

#### IV. Conclusion

In reviewing these thoughts and those of the other attached working papers, it seems clear that we are faced with a situation where the man with high defense or military responsibility must be able to understand the abstractions of philosophy and theory and at the same time be capable of dealing with facts and action in the areas of policy, doctrine and plans.

It is equally important to make sure that the scientist and others who are working in hardware research and in weapons systems have an understanding of how their work is related to these more fundamental matters.

Since military education comes under the service chiefs and the J.C.S., the influence of the Assistant Secretary for Supply and Logistics well may be chiefly indirect. Nevertheless, we must remember that the influence of civilian institutions such as Harvard, Ohio State, Columbia, Princeton, and others

which have programs related to national defense is very great. Therefore, the senior civilian executives in the Department of Defense have a significant interest in these matters regardless of the particular organizational procedures which have been laid down.

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